Space Weather Forecast

Issued on Saturday, 31 December 2022 at 12:40 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of further Moderate X-ray flares throughout. Possible glancing blow from a CME late on Day 4 (3rd Jan).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar Activity has been Moderate in the past 24 hours with two Moderate class flares, both originating from a moderately large and complex region in the northeast quadrant. There are currently five numbered active regions on the visible disc. Aside from the region mentioned above, the other most noteworthy regions are a recently numbered region which is still emerging around the northeast limb. This region gave a Moderate class flare on the UTC evening of 29th; a bi-polar region located in the northwest quadrant and which continues to show growth, but has been relatively inactive; and a region in the southeast quadrant, which is a moderately large bi-polar group showing some slight growth, again largely inactive at present.
Coronagraph imagery from STEREO-A imagery indicates a coronal mass ejection (CME) was associated with the Moderate flare at 30/1528 UTC from the active region in the northeast quadrant. This has been analysed and shows a possible glancing blow at Earth either late on the 3rd Jan (Day 4) or early on the 4th Jan (beyond our current forecast period), although with low confidence.

Solar Wind / Geomagnetic Activity: Solar winds were indicative of coronal hole connection, rising rather erratically through elevated levels to just peak at Strong for a time, before dropping back to elevated levels at present. Total strength of the magnetic field was at mostly Moderate levels, but has also dropped to weak levels in recent hours.The north-south component was often negative and fluctuated with Moderate strength, before also becoming less disturbed in recent hours. Geomagnetic activity was mostly Unsettled to Active (Kp 3-4), with a G1/minor storm (Kp 5) observed 30/1500-1800 UTC, although activity has declined to mostly Quiet (Kp 2) in recent hours.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) was at background with no solar radiation storms occurring.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is expected, with an ongoing daily chance of Moderate X-ray flares. There is a slight chance of Strong class flares occurring.

Solar Wind / Geomagnetic Activity: A coronal mass ejection (CME) which was observed in coronagraph imagery, associated with the Moderate flare at 30/1528 UTC from an active region in the northeast quadrant has been analysed and shows a possible glancing blow at Earth either late on the 3rd Jan (Day 4) or early on the 4th Jan (just beyond the current forecast period). No other Earth directed CMEs were observed. The ongoing coronal hole influence is expected to continue on day 1 (31st), before gradually declining days 2 and 3 (1st and 2nd). No further coronal hole enhancements are expected during the forecast period. Geomagnetic activity is

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expected to be mostly Quiet to Unsettled, with a chance of an Active interval, as the fast wind begins to wane over the coming days. Mostly Quiet conditions likely days 3 and 4 (2nd and 3rd Jan), although with a possible glancing blow from a CME late on Day 4 (3rd Jan) which may enhance geomagnetic activity, although this is low confidence.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is forecast to remain at background with no solar radiation storms occurring. However, there is a slight chance of these rising in response to any larger flares that may occur, and perhaps exceeding the S1/Minor Radiation storm level.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	30	5	1	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	50	50	50
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	10	10

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Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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